



APPLICATION OF PERFORMANCE OBJECTIVE PRODUCTIVITY (P.O.P) THROUGH ERGONOMICS APPROACH

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ABSTRACT- Ergonomics (from the Greek word ergon meaning work, and nomoi meaning natural laws), is the science of enhancing the design of products to optimize them for human use. Human dynamics , such as height, weight, and proportions are taken into consideration , as well as factors such as human hearing, vision, temperature preferences, and so on. Ergonomics is sometimes known as human engineering. In the era of Digital Explosion, Computers and related products, such as computer tables and chairs, are dominantly the stress point of ergonomic design. Employees at work place use these products and designs for a long span of time .Not to talk of the pressed days ,the regular working days have also become very demanding . If the design of the product is faulty or improperly adjusted for human use, the employee using them may suffer unnecessary fatigue, stress, and even injury. The study of Ergonomics is essential because when you're doing a job and your body is under pressure by an unscientific posture, intense temperature, or repeated movement your musculoskeletal system is adversely affected. Our body may develop symptoms such as fatigue, discomfort, and pain, which can be the early signs of a musculoskeletal disorder. This paper tries to find out the effect of Ergonomics study on two independent samples of males & females and other factors related to their readily acceptance of the science of Ergonomics. A sample of males & females was taken and t test was used for data analysis .The output of the paper will benefit the organizations to employ better practices for the implementation of Ergonomics. It is along these lines imperative to realize what financial and modern techniques would be generally productive if O.H.S. what's more, ergonomic applications are to be actualized by and by. For practical working environment improvement ; this prompts powerful profitability levels through the proper degrees of laborers government assistance and occupation fulfillment which can be improved through the automation of creation exercises and ergonomics. In such manner; work – related information is significant that would help modern business people from numerous points of view. They might be uncertain about whether they ought to obtain refreshed data in

contributing their capital and apparatus as indicated by the nearby specialist's convention; culture; atmosphere; work; profile and the current format of work destinations, for example. Laborer's physical outstanding task at hand ; heat pressure and thermoregulatory related investigations were led yet those don't contain a wide range of exact information and ergonomic data. Anyway it is realize that work the board and profitability profile are not indistinguishable in all ventures

Keywords: O.H.S., Laborer's, Computers, Ergonomics

I. INTRODUCTION –

The general point of this article is to make a wellspring of business related data for various little – scale and medium – measured manufacturing plants , this will assist with recognizing conceivable future research open doors just as individual examination proper for such open doors in other mechanical units. It likewise considers some key issues with important business related writing that fill in as an asset; experts and others can profit by the contextual analyses remembered for this article. Consequently; general goals of the contextual investigations are to ; Give an exhaustive assessment of OHS and ergonomic issues in various work environments.

- Present ; screen and approve uniform systems for recording and investigation of work – related information and data.
- Investigate significant determinants of physical outstanding task at hand (basic work act Musculoskeletal scatters ; heat pressure and so on.) ailment manifestations ; non-clean parameter ;psychosocial ; mediating and neighborhood components of move work.
- Clarify wellbeing , cleanliness ; Safety and ergonomic issues for supportable work environment



improvement in little and medium – estimated endeavors where physical work (for example manual materials taking care of) is serious ; however it is common practice.

- Draw laborer's mindfulness and open consideration towards dangerous acts and conditions.

II. HISTORY OF ERGONOMICS

History of Ergonomics Although the use of the word 'ergonomics' is relatively new, the concept itself is not. One of the first noted interests in ergonomics was in the 16th century, from Italian physician Bernardino Ramazzini, who wrote a medical journal ('De Morbis Artificum' - translated as 'Diseases of Workers') about complaints from his patients. The journal details a variety of injuries and how these related to the working environments and occupations of his patients. The use of the term 'ergonomics' was eventually coined by Wojciech Jastrzebowski and came into use around 1857. The concept of ergonomics in the 19th century was introduced by Frederick Winslow Taylor. A 'scientific management' was implemented as a method for increasing Productivity & efficiency in workers shoveling coal. Taylor found that by reducing the size and weight of the shovels used, the amount of coal being shoveled was tripled. The changes in the shovel design also lead to reductions in work related injuries and increases in productivity. In the 1900 the concept of ergonomics was further explored in the 'Time and Motion Studies' by Frank and Lilian Gilbreth, which examined techniques for decreasing the number of motions required to perform a given task successfully. In one example brick layers were able to increase their productivity from 120 to 350 bricks laid in one hour, due to a reduction in the number of motions involved per brick lay. Ergonomics was further used during World War II to enhance cockpit design as a means to reduce pilot errors and increase safety.

III. METHODOLOGY AND APPLICATION FOR PRODUCTIVITY IMPROVEMENT

Word related wellbeing and security (O.H.S) basically tries to keep up the working capacity of the work power just as to distinguish ; evaluate and forestall dangers inside the workplace. Ergonomics , on the other hand, joins these mechanical creation through the plan of an improved working environment. O.H.S. what's more, ergonomic applications in this manner cooperate to fulfill the necessities of charging neighborhood individuals' perspectives ; nearby work strategies or potentially conventional methods of getting things done. It is hence significant for both remote and nearby financial specialists to explore work environments; to know how an apparatus; hardware and creation procedure would coordinate the neighborhood laborer's physical and mental capacity of the nearby populace O.H.S furthermore, ergonomic issues are additionally

related with the creation economy and social advancement; and in this way; significant parts of gross household creation (G.D.P.) For feasible working environment improvement ; this prompts compelling profitability levels through the fitting degrees of laborers government assistance and employment fulfillment which can be improved through the motorization of creation exercises and ergonomics.

In such manner ; work – related information is significant that would help modern business people from multiple points of view. They might be uncertain about whether they ought to secure refreshed data in contributing their capital and apparatus as indicated by the nearby laborer's convention ; culture ; atmosphere ; work ; profile and the current format of work destinations, for example. Specialist's physical remaining task at hand ; heat pressure and thermoregulatory related examinations were directed however those don't contain a wide range of observational information and ergonomic data. Anyway it is realize that work the board and efficiency profile are not indistinguishable in all enterprises

Let

U = the sub-system

V = the KPA

Y = the Performance Objectives

W = the Weightage factor

O_{yv}u = the performance Value of PO – y KPA – v
in sub – system u

O_{yvu} = the Objectivated Output of PO – y KPA – v
in sub – system u

Productivity Index PI of a system S , is arrived at as,

$$PI = \sum W_i$$

1

(PI)_u the productivity Index of sub – system

(PI)u the productivity index
u is determined as,

.....

$$u = 1$$

Wh

$\sum_{v=1}^V w_{vu} = 1$, for all u's.
 $(\Pi)_{vu}$, the Productivity Index of key performance Area v of sub-system u is given as

v=1

$$\sum_{v \in V} w_{vu} = 1, \text{ for all } u \text{ and } v$$

v=1

Substituting values of $(PI)_{vu}$ from equation (iii) in equation (ii) Productivity Index $(PI)_u$ of a sub-system u can be rewritten as.

$$(PI)u = \sum \sum Wvu \quad Wvu \quad Oyu/O'yvu$$

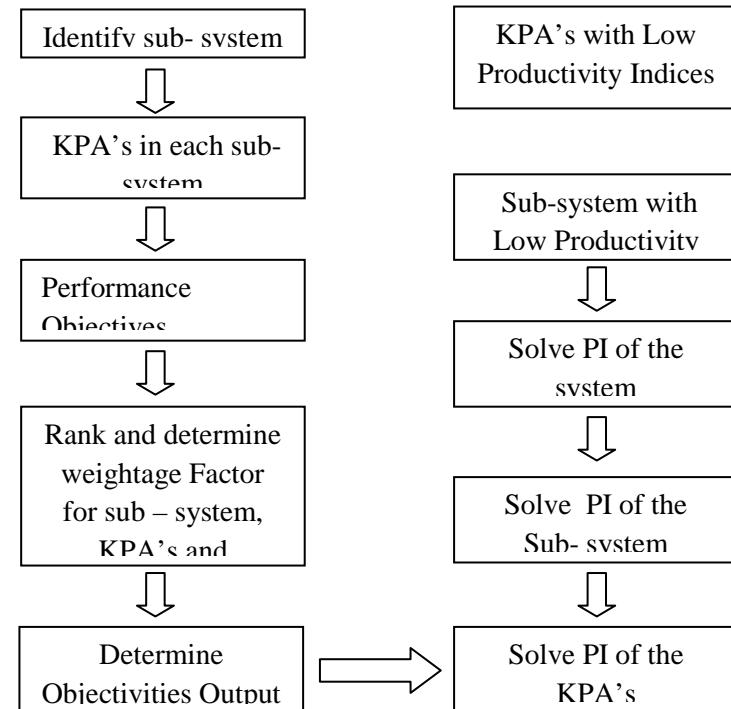
.....(iv)



$y=1v=1$
Value of $(PI)u$ from equation (iv) can be substituted in equation (i) to provide PI , the Productivity Index of a system S , as

$$PI = \sum_{\mu=1}^n \sum_{v=1}^V \sum_{y=1}^Y Wu Wvu Wyvu Oyvu/O'yvu$$

IV. FLOW CHART FOR THE PROCESSES FOR USE OF PO-P APPROACH FOR PRODUCTIVITY MEASUREMENT:



IDENTIFICATION OF SUB- SYSTEMS:

The concerned little scope metal utensil producing industry can be considered to work as a framework with following sub – framework:

1. Creation sub-framework (A)
 2. Innovation sub-framework (B)
 3. Material sub-framework (C)
 4. Objectives and qualities sub – framework (D)
 5. Showcasing sub-framework (E)
 6. Ergonomics sub-framework (F)

V. THE FOLLOWING KPA'S FALL UNDER CONSIDERED SUB-SYSTEMS:

SUB-SYSTEM	PERFORMANCE AREA (KPA)
1. Production sub-system (A)	1. Manpower Utilization
	2. Assets Utilization
	3. Quality of Production
2. Technology sub-system (B)	1. Design & Development
	2. R&D/ Innovation



3. material sub-system (c)	1. Storage Management
	2. Inventory control
4. Goals and value sub-system (D)	1. Employee Satisfaction
	2. Customer Satisfaction
	3. Social Goals

A	Production	5	0.192	Production	5	0.208
B	Technology	5	0.192	Technology	5	0.208
C	Materials	1	0.038			
D	Goals & Values	1	0.038			
E	Marketing	10	0.384	Marketing	10	0.417
F	Ergonomics	4	0.153	Ergonomics	4	0.167



SUB SYSTEM	PERFORMANCE	PERFORMANCE OBJECTIVE (PO)	RELATIVE WEIGHT OF PO's (by the method of direct scaling)	WEIGHTAGE FACTOR	OBJECTIVE VALUE	ACTUAL VALUE
Production	1. Manpower utilization	1. direct labour utilization: 2.Cost effectiveness: Standard hrs recovery 3. Is the brick manufacturing unit uses locally available man.	40 10 50 TOTAL = 100	0.4 0.1 0.5 1	0.793 0.0448 1	0.751 0.0405 0.8
	2. Assets utilization	1. Capacity utilization: Standard hrs recovery/personal expenses	100 TOTAL = 100	1	0.0448	0.0405
	3. Quality of production	1. Index of defect free production: value of defect free production/value of total production	100 TOTAL = 100	1	1	0.8



Technology	1. Design & development	1. Is the brick manufacturing unit uses locally available low cost technology intangible scale (0-1) 2. Are brick manufacturing unit aware of the locally available technologies intangible (scale 0-1) 3. design, getting approved 4. CAD facility ? 5. Are there any traditional drafting practices after finalization of design intangible (scale 0-1) 6. Are there any process of verification and validation of design intangible (scale 0-1) 7. Is there a system to acquire and assimilate a new technology ? intangible (scale 0-1)	30 30 10 0 10 5 5	0.4 0.3 0.1 0 0.1 0.05 0.05	1 0.7 0.4 1 1 0.1 0.1	0.8 0.6 0.3 0 0 0 0
	2. R&D / innovation	1. Has the gap analysis of the present and required science 2. when key	10	0.1	0.1	0



		<p>customer requirement are not met ? intangible (scale 0-1)</p> <p>3. does brick manufacture have quality manual ? intangible (scale 0-1)</p> <p>4. does the brick manufacturing unit uses SWOT analysis from time to time for fixation of the future strategies ? Intangible (scale 0-1)</p>	40 20 30 TOTAL = 100	0.4 0.2 0.3 	0.4 0.1 0.1 	0.3 0 0
Marketing	1. Sales	<p>1. Sales absolute monetary intangible (scale 0-1)</p> <p>2. Profitability profit/sales intangible (scale 0-1)</p>	50 TOTAL = 100	0.5 0.5 	38937600 0.166	38188800 0.166
	2. Marketing Research	<p>1. flexibility to change production capability intangible (scale 0-1)</p> <p>2. flexibility to cope up with varying demand intangible (scale 0-1)</p> <p>3. are customers satisfied with the quality and price of the product ? intangible (scale 0-1)</p>	30 40 30 TOTAL = 100	0.3 0.4 0.3 	0.1 0.4 0.7 	0 0.3 0.5
	3. Sales advancement	<p>1. Do schemes of government and NGO help in creating demand for brick intangible (0-1)</p> <p>2. Is there any group effort on behalf of manufactures to market their product ? intangible (scale 0-1)</p> <p>3. Are brick exported ? intangible (scale 0-1)</p> <p>4. Does government provide financial assistance for</p>	30 40 0 30 TOTAL = 100	0.3 0.4 0 0 	0.1 0.7 0.1 0.1 	0 0.5 0 0

Ergonomic s	1. Pers onal ,cap abi ty	1. experience required for the work up to mark 2. what is the level of interest among the workers to do the job ? 3. manpower properly trained to use the existing level of technology ?) 4. Do the workers, meet the adequate physical characteristics requirements	30	0.3	0.7	0.6
			10	0.1	0.4	0.3
			30	0.3	0.7	0.6
			30	0.3	0.7	0.6
		TOTAL = 100				
2. Wo rki ng co ndi tio n	1. facilities properly laid out to assist the worker in doing the work 2. tools upto date 3. environment around the work 4. Is the work load properly distributed among the workers ? intangible (scale -1)	30	0.3	0.7	0.6	
		20	0.2	0.1	0	
		20	0.2	0.4	0.3	
		30	0.3	1	0.8	
		TOTAL = 100				
3. othe r	1 any rules regulations and policies regarding the work culture	10	0.1	0.4	0.3	
	2. measures taken to overcome mental distraction	10	0.1	0.1	0	
	3. work schedule and rotation, among the workers properly carried out	40	0.4	1	0.9	
	4. workers subjected to unusual environmental stress	40	0.4	0.7	0.6	
		TOTAL = 100				

5.2 WEIGHTAGE OF KPA'S (KEY Performance Areas)

Method of Direct Scaling:



In this technique the weighing is done legitimately. The evaluators are approached to choose the overall load of every one of the subordinate components speaking to relative significance for the utility of the related component on the following of progressive system. The aggregate of the all out loads of all components is Identified as hundred.

VI. RESULT AND ANALYSIS

6.1 ANALYSIS OF PERFORMANCE INDEX

Sub -system	Weightage factor	KPA (Key Performance Activity)	Weightage factor	PI of KPA	PI of Sub-system
Production	0.208	Manpower Utilization	0.5	0.8692	
		Assets Utilization	0.3	0.9041	
		Quality of production	0.2	0.8000	
				0.8658	
Marketing	0.417	Sales	0.4	0.9903	
		Market research	0.4	0.5143	
		Sales promotion & Publicity	0.2	0.2857	
				0.6590	
Technology	0.208	Design & development	0.6	0.5721	
		R&D / Innovation	0.4	0.3000	
				0.4632	
Ergonomics	0.167	Persona capability	0.4	0.8464	
		Working condition	0.3	0.6471	
		Other	0.3	0.7778	0.7660

$$\text{Productivity Index of the system} = (0.8658 * 0.208) + (0.6590 * 0.417) + (0.4362 * 0.208) + (0.7660 * 0.167) = 0.6791$$

6.2 ANTICIPATED IMPROVEMENT

S. NO.	Sub systems	Questionnaire	Response old	Response (anticipated)	Objectivated (anticipated)	Actual (anticipated)
1	Producti on	1. Is the brick manufacturing unit uses locally available man power for its operations ?	Very Much	Very Much	1	0.8
2		1. Is the brick manufacturing unit uses locally available low cost technology.	Very much	Very much	1	0.8
		2. Are brick manufacturing unit aware of locally	Largel y	Very much	1	0.8



		available technology ?				
		3. Is the design getting approved before production run ?	Mode rately	Largely	0.7	0.6
		4. Is there any CAD facility ?	Not at all	Not at all	0	0
		5. Are there any traditional drafting practices after finalization of design	Not at all	Not at all	0	0
		6. Are there any process of verification and validation of design ?	Not at all	Not at all	0.1	0
		7. Is there a system to acquire and assimilate a new technology ?	Not at all	Largely	0.7	0.6
	2. R&D /Innovation	1. Has the gap analysis of the present and required technology level done ?	Not at all	Moderately	0.4	0.3
		2. Does brick manufacture take Corrective action when key customer Requirement is not met ?	Mode rately	Largely	0.7	0.5
		3. Does brick manufacturer have Quality manual ?	Not at all	Not at all	0.1	0
		4. Does the brick manufacturing Unit uses SWOT analysis from time to time for fixation of the future strategies ?	Not at all	Moderately	0.4	0.3
	Marketin g					
	1. Market Researc h	1. Flexibility to change production capability ?	Not at all	Largely	0.7	0.6

**Anticipated
Productivity Index (PI)**

$$(0.8858*0.208) + (0.7638*0.417)+(0.6470*0.208) + (0.8739*0.167) = 0.7832$$

RESULT

The anticipated productivity index have increased from , 6791 to 7832



VII. CONCLUSION & SUGGESTIONS

The present level of proficiency is evaluated using method of productivity estimation named as execution Objective – gainfulness (PO-P). approach lays weight on the pieces of ID of regions with low benefit so as to accomplish improvement. Its central perspective lies in the conviction that input resources of an affiliation can't be found in imprisonment. A presentation targets and their weightage. To fuse execution objective of abstract nature's survey is used. For productivity estimation three sub – structure essentially 'Development', 'Workplace' and 'Market' has been recognized where improvement in productivity was required. For gainfulness enhancements, in the zone of 'Development' 'working condition' and 'Market factor', the Study looked at all of these sub – structure and thought of suggestions that updates proficiency of these on a very basic level. From an investigation of the heaters working in various bits of the Jharkhand state. I have a firm conviction that it is a great deal of possible to make these heaters 'CLEAN' to give amicable and sterile condition to the workers. The way is there , will is required. All The updates demonstrated above need be followed cautiously. It won't only result in all things considered saving of fuel anyway will moreover make the workplace clean. Minor interests in these undertakings will be more than reimbursed by the sound and clean biological that has so for got away from the square kilns. It is time square industry stops its old fashioned look of and pensive individual formed system and approaches as a dynamic and present day looking affiliation. The business should intentionally assist lawful bodies in state and national excitement to ensure the nature and condition in its rough structure to be available to the achievement. I believe the state government will adjust to the circumstance and react to the call of giving a 'Great' space to the workers in their broilers. I am convinced they will win in this earnest effort. The ergonomic perspectives highlighted in this investigation work will remove the prosperity danger of the workers of the natural relics delivering and will give better strong conditions. In order to reduce musculoskeletal issue of the workers essential measures should be taken , as per the recommendations to re-structure workstations. With the upgrades in working position (considering ergonomic guidelines) , gainfulness levels will in like manner be improved. The new suggested working positions, diminishes loosening up settlement as well. This constructs the amount of influential man-day of work and from now on increases in productivity. The proposed present also diminishes to unfathomable degree the feebleness towards musculoskeletal upsets (MSD) subsequently extending the amount of yield once can make during the work.

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